Spring 2019 Issue III

SESI NEWSLETTER

THE SCIENTIFIC AND ENGINEERING STUDENT INTERNSHIP AT NASA/GSFC

(Above) Students and mentors gather at the Goddard Information and Collaboration Center for the 2018 intern orientation.

What is SESI?

Training our newest generation of Heliophiles

SESI is a cooperative program between the Institute for Astrophysics and Computational Sciences (IACS) at The Catholic University of America (CUA) and the Heliophysics Science Division at NASA Goddard Space Flight Center (GSFC) in Greenbelt, MD.

The program provides talented students, ranging from high school to graduate school, with exciting research opportunities and the chances to work with their mentors (the scientists, engineers, and researchers of GSFC) in the areas of solar and heliospheric physics, data analysis and computational modeling, building space hardware, and many other engaging scientific fields.

Students attend weekly lectures from senior scientists, tour Goddard's facilities, and provided with the option of extracurricular weekend activities in the DC area such as picnics, hiking, and museum tours.

In this Issue

Important Dates

Main Program Begins	6/3
HS Program Begin	6/24
Division Lectures	6/12, 6/19, 6/26, 7/10, 7/17
Student Presentations	7/24, 7/31, 8/7
Enrichment Activities	6/21
HS Program Ends	8/2
Main Program Ends	8/9

Interview with a Mentor

Doug Rowland is the Chief of the newly formed Ionospheric, Thermospheric, Mesospheric (ITM) Physics Laboratory. He joined the Heliophysics Division at NASA Goddard Space Flight Center in 2003 as a National Research Council Fellow and since has held integral leadership roles for many sounding rocket and satellite missions.

What is your research focused on right now?

My main research focus is ion outflow – understanding how atmospheric gases get heated and ejected from their planet's gravity well. Our main activities right now are developing new techniques to image this previously invisible process using energetic neutral atom imaging instruments. We recently completed a sounding rocket campaign in Ny Ålesund, Norway, where we launched two suborbital rockets into the earth's magnetic cusp (the points where the solar wind can directly impact the upper atmosphere) to see how cusp aurora can drive ion outflow.

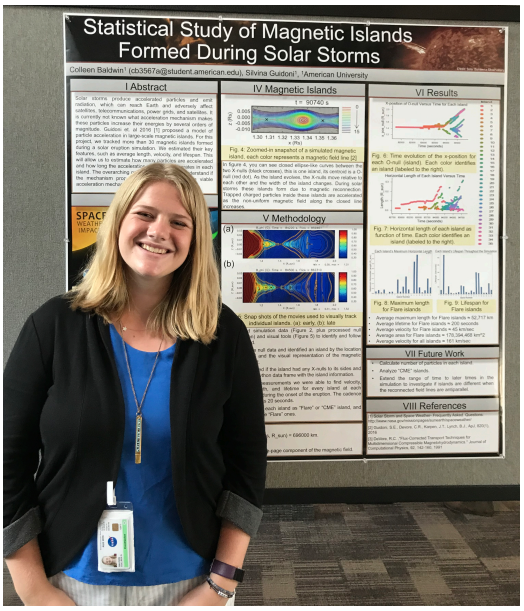
How have you found the mentoring experience? What would you say to a researcher interested in mentoring?

My time as a mentor has been very rewarding. It's always energizing working with students to find and execute on projects that can contribute to our research effort while providing valuable educational experience for them. I always end the summer feeling revitalized and excited to work to continue those projects. And yes, mentoring helps to further my research. I believe that if a student is working in our group they should do something that is contributing to advancing the cutting edge. Whether it's an engineering design project or a data analysis or mission design project, I want them to develop something new that wouldn't have existed if they didn't come to our group.

For researchers considering becoming a mentor, I'd say it's important to think carefully about a range of projects a student could do. It's tough to find that sweet spot between something that's useful to you and the student, and allows enough flexibility in case things develop differently during the project than you expect. Some of my colleagues are really great at this critical first step – developing projects. I struggle with it at times, but when you find a great project that's a good match for the student it makes everything better.

Any other comments?

I would also advise students who are looking to break into a field – don't be shy – ask people to explain their research to you. Do this both before you select a project and even during your summer project. Put yourself out there. Explore the range of potential problems you could work on or careers you could pursue. Many students just treat the internship process like a blind lottery. They put their applications in in a shotgun approach, and there's not much to distinguish one high performing student from another. If there's a particular project that really grabs your interest, reach out to the people involved in that project. Find out more about it. Do your homework. That will give you a more rewarding research experience, and it will also make you more likely to land the research project in the first place, especially if it's a highly competitive one.



A Student Perspective

Colleen Baldwin is a sophomore at American University currently pursuing a double major in Physics and Computational Science. During the 2018 SESI program she worked with Silvina Guidoni on the formation of magnetic islands during solar storms. She recently presented her work at the Student Research Poster Session of the National Council of NASA Space Grant Directors Meeting in Arlington, VA.

(Left) Colleen presents her work at the Summer Intern Poster Session.

What made you apply for an internship in the Heliophysics Science Division?

I wanted to apply for an internship because I wanted to do research in my area of study and learn about the different types of research I can do with my major! I had never done any research and I had no knowledge of heliophysics before this internship and spent many of the first weeks learning about heliophysics through bootcamps, lectures and the guidance of my adviser. Ultimately I ended up doing data science research on simulations focusing on the magnetic effects of the sun during solar storms. After the internship, I am almost certain I want to go to graduate school and get my Phd in a computer science area.

How did the internship affect your current research?

After the work I did this summer, I realized my passion for research and have currently been working on a couple of different research projects using data science. I am working with the American University environmental science department under Valentina Aquila to calculate statistical measurements of a variety of variables El Ninos though simulations. I also work with the American University Incubator to use data science to better understand mood disorders.

From my internship over the summer at the Heliophysics Science Division, I was recruited to work at two amazing opportunities, the first at Los Alamos National Laboratory in New Mexico, coding on satellites and secondly working with the n-body simulation in the field of Astrobiology.

What was the most exciting or surprising part of your internship?

The most exciting part of my internship was being able to attend daily lectures and consistently learning new things. I thought before my internship, I would primarily just be coding but my internship program very much encouraged me to attend lectures and learn about the different areas of sciences. Overall my summer internship was amazing and would recommend everyone to apply for this program. I would definitely apply for a summer internship as it is a great opportunity to learn about yourself and about new subjects. I also want to thank the DC Space Grant Consortium for allowing me to have this amazing opportunity.

(Above) Current and former graduate students answer questions from the interns.

2018 Highlights

Throughout the summer a series of lectures were organized that introduced the interns to the research led by the Heliospheric Division. Guest lecturers were solicited from across the labs and representing a range of career stages.

On July 23 fourteen HSD summer students participated in a SESI-organized intern exchange with the NOAA Center for Weather & Climate Prediction. The interns toured the facilities and observe several briefings. Later that week the NOAA interns visited NASA GSFC.

(Above) SESI participants visit NOAA

On August 7 the interns attended a panel with current and recent graduate students. The panelists addressed their experience with the application process, choosing a mentor and topic, writing and thesis, and job prospects after graduating, in addition to answering direct questions from the interns.

On August 1 the students took part in the Summer Intern Poster Session (an OSSI led activity). During the week prior, students participated in practice poster presentation activities.

In the final week of the program the interns presented the work that they accomplished over the summer. Thirteen students gave ten presentations summarizing their results.

(Above) The 2019 SESI team - Christina Kay, Burcu Kosar, Silvina Guidoni, and Teresa Nieves-Chinchilla

2018 Projects

- Machine learning application in heliophysics
- Coronal heating and solar wind origins
- Particle energization at heliospheric shocks
- Characterizing magnetospheric states
- Developing physical models for the understanding of the space environment
- Space weather forecasting internship
- Sounding rocket systems, aerospace, and electrical engineering
- STEAM Innovation Lab assistant